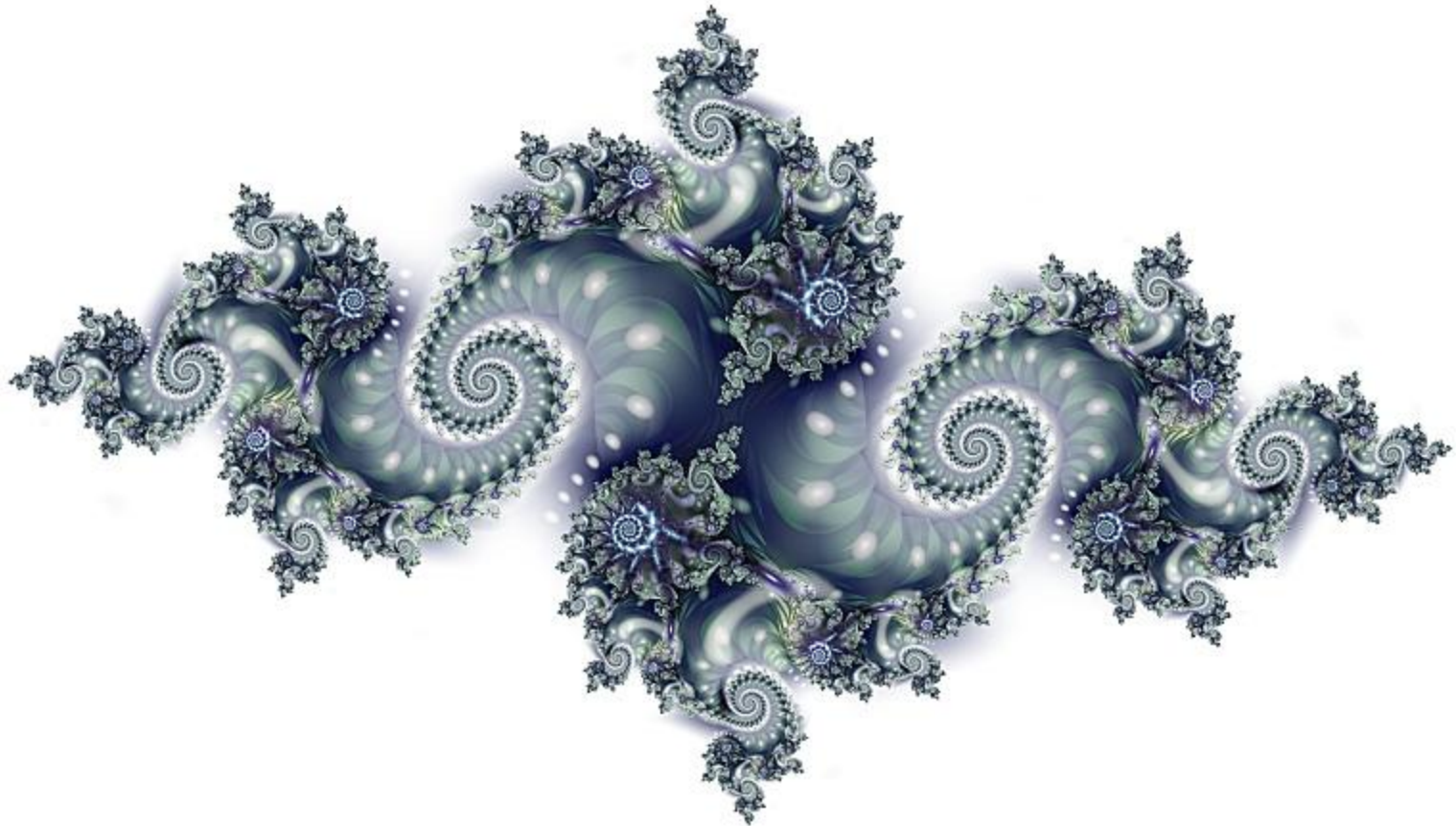


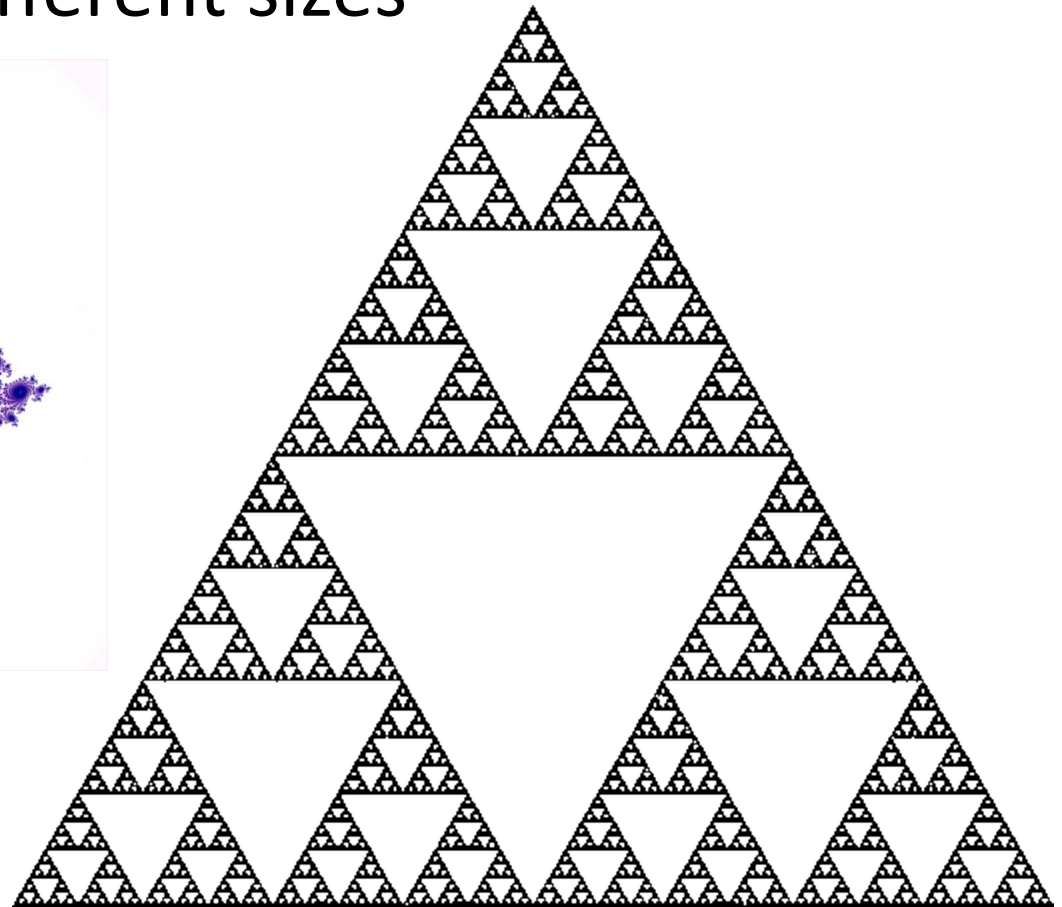
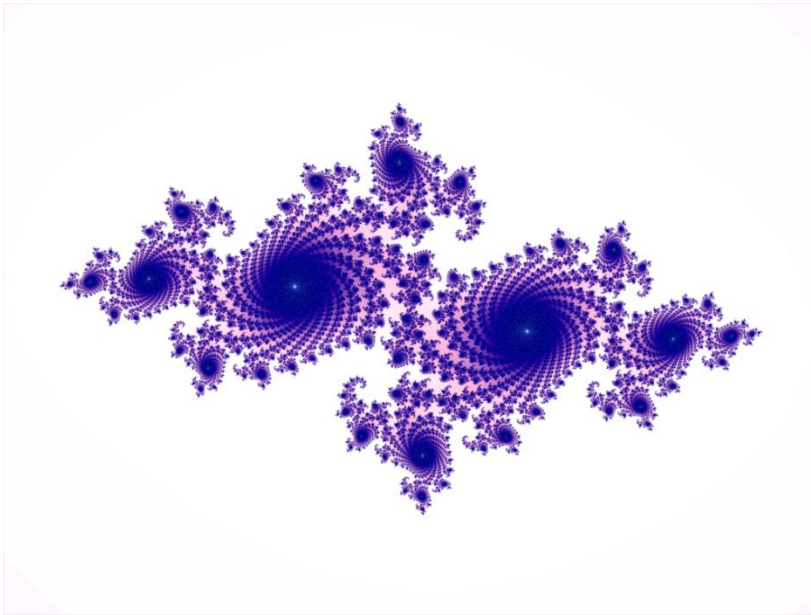
FRACTALS



UDLS by Andrej Karpathy

How to spot them

- Has detail on every level
- Is self-similar at different sizes



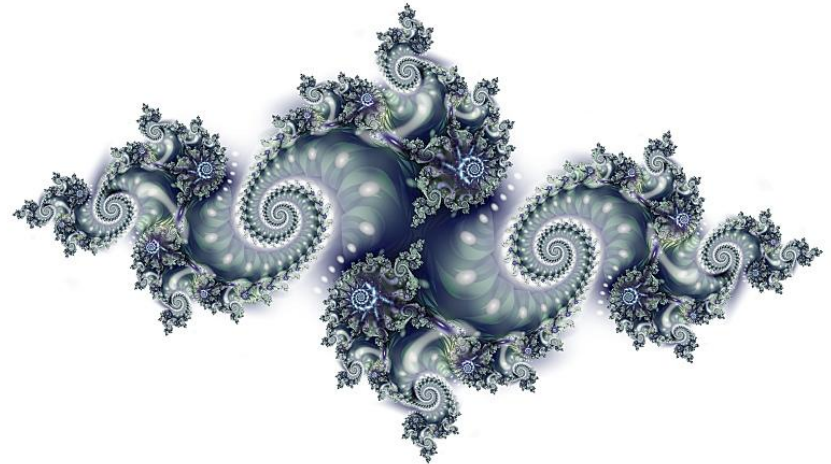
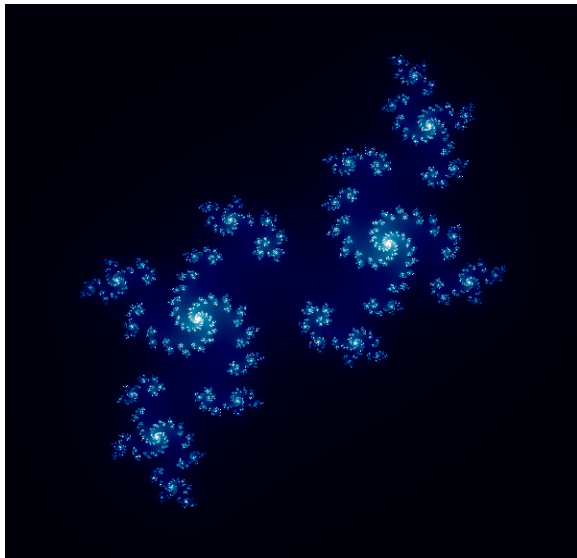
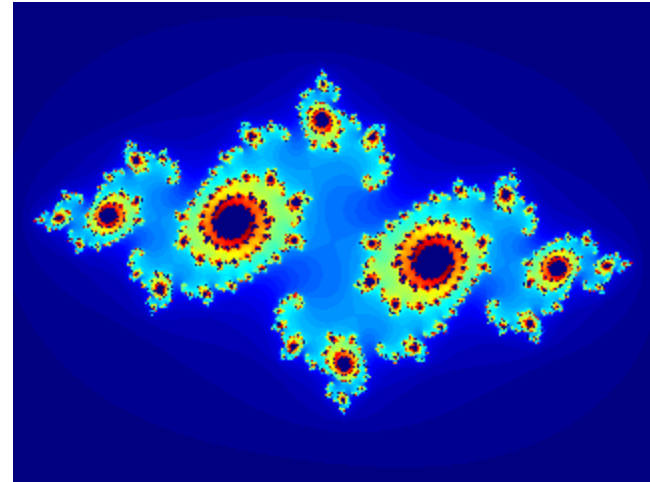
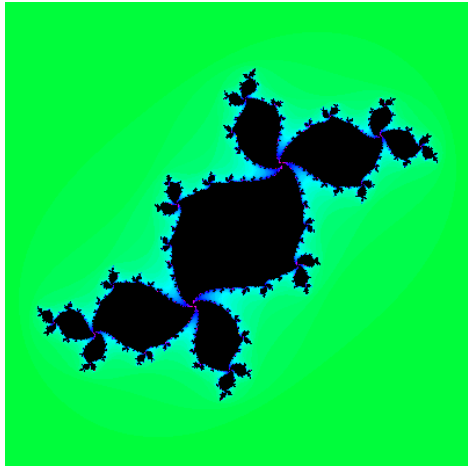
test



Not magic

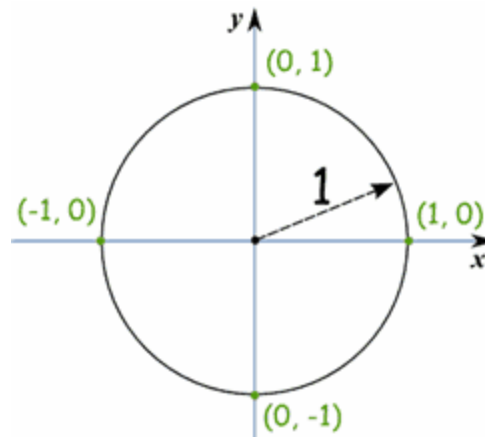
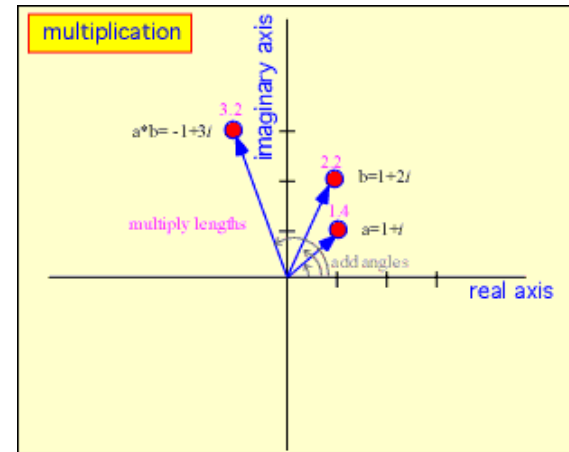


Julia Sets: How are they generated?



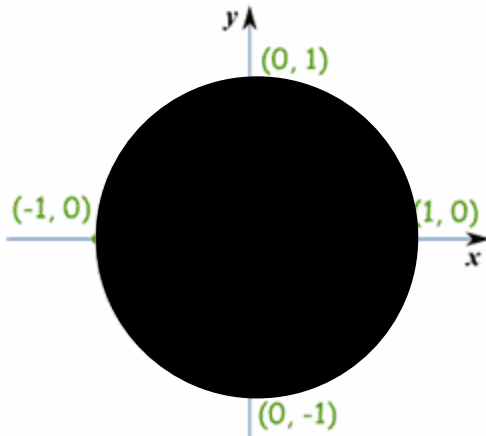
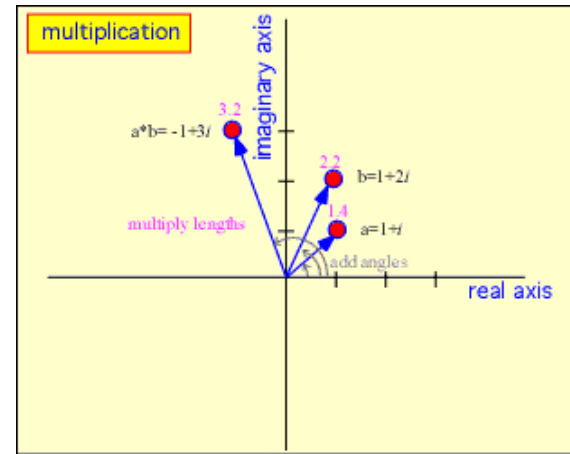
Function iteration

- `c= some_complex_number()`
- for all `x,y` in window of interest:
- `z= x + iy`
- for `i=1..1000`:
- `z= z^2 + c`
- if `|z|<4`: color (`x,y`) black

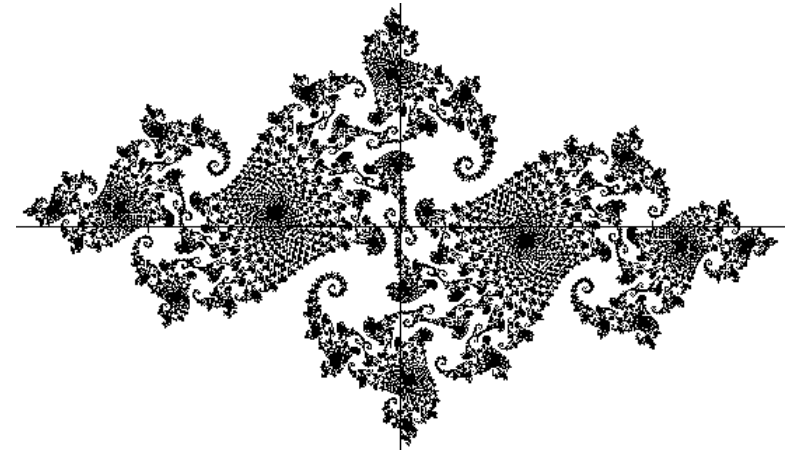


Function iteration

- `c= some_complex_number()`
- for all `x,y` in window of interest:
- `z= x + iy`
- for `i=1..1000`:
- `z= z^2 + c`
- if `|z|<4`: color `(x,y)` black



$c=0$



$c= 1.23+0.7i$

Mandelbrot set

- always start at 0, and look at effect of changing c

for all x, y in square of length 2:

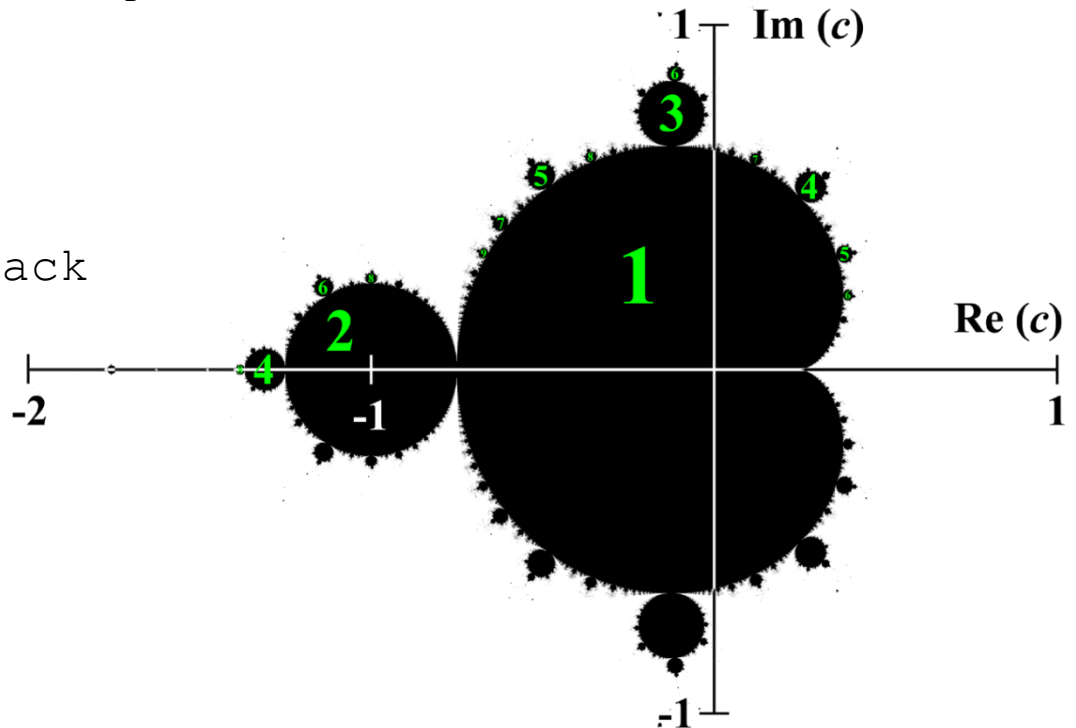
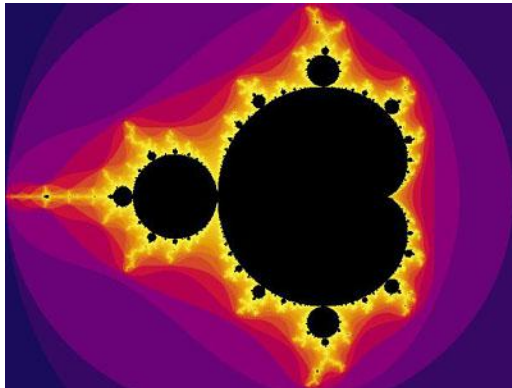
```
c= x+iy
```

```
z= 0
```

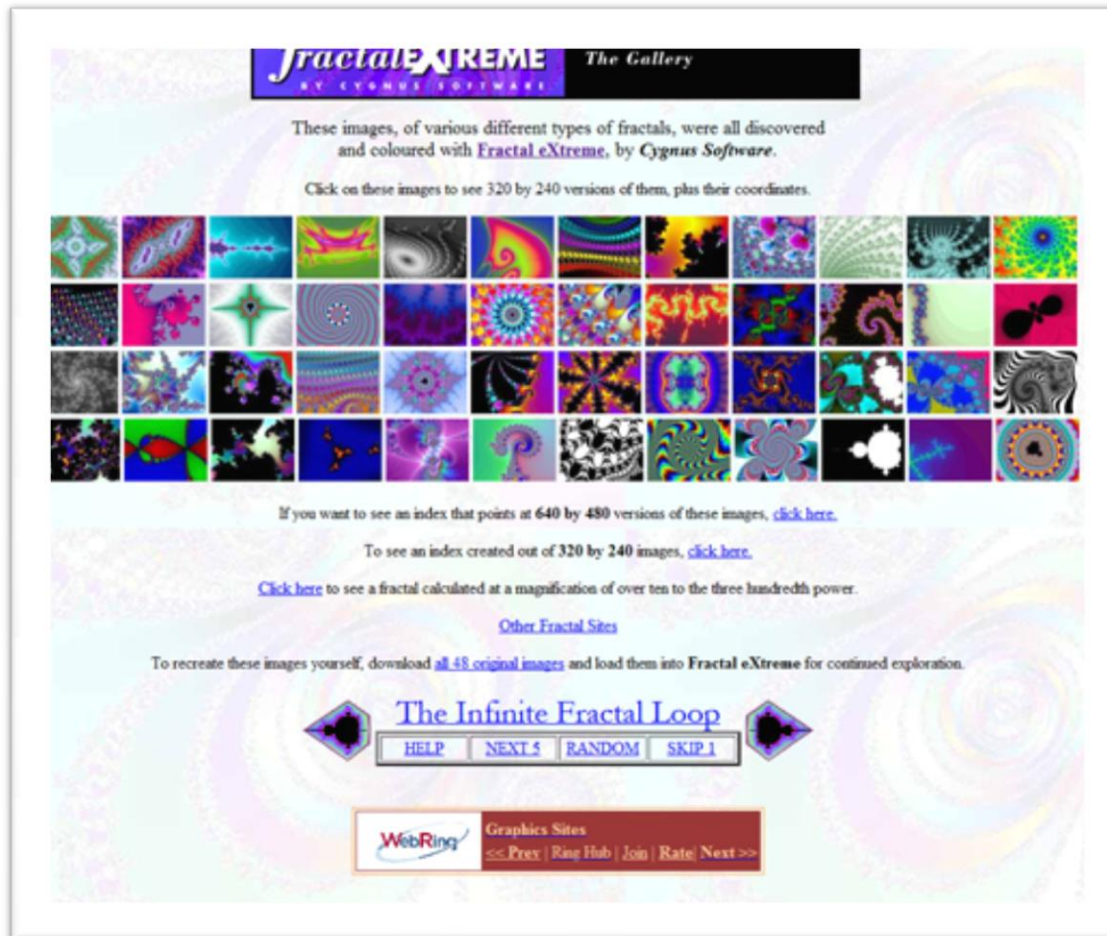
```
for i=1..1000:
```

```
  z= z^2 + c
```

```
  if z<2: color (x,y) black
```




Demo of fractal eXtreme



Fractal eXtreme The Gallery
BY CYGNUS SOFTWARE

These images, of various different types of fractals, were all discovered and coloured with [Fractal eXtreme](#), by *Cygnus Software*.

Click on these images to see 320 by 240 versions of them, plus their coordinates.



If you want to see an index that points at 640 by 480 versions of these images, [click here](#).

To see an index created out of 320 by 240 images, [click here](#).

[Click here](#) to see a fractal calculated at a magnification of over ten to the three hundredth power.

[Other Fractal Sites](#)

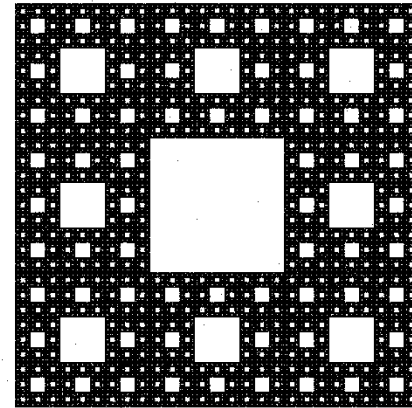
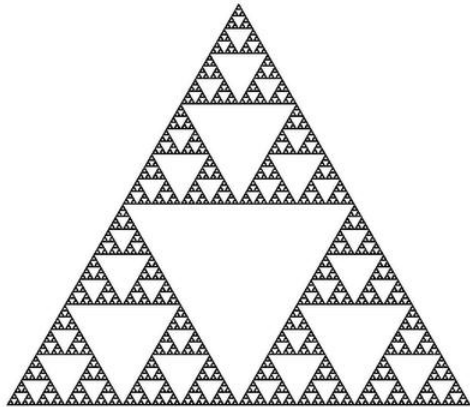
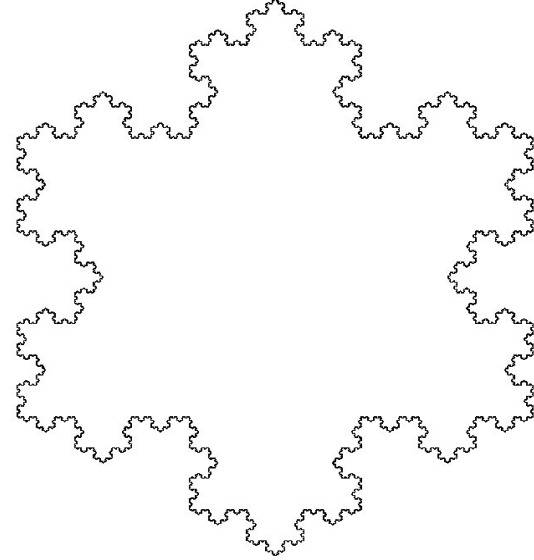
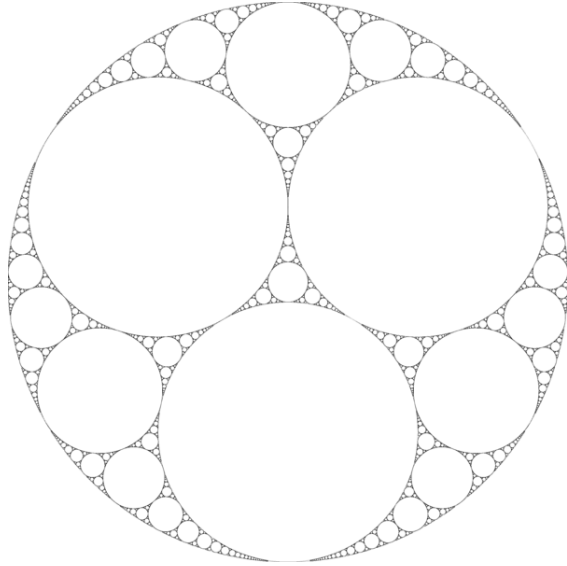
To recreate these images yourself, download [all 48 original images](#) and load them into *Fractal eXtreme* for continued exploration.

[The Infinite Fractal Loop](#)

HELP NEXT.5 RANDOM SKIP.1

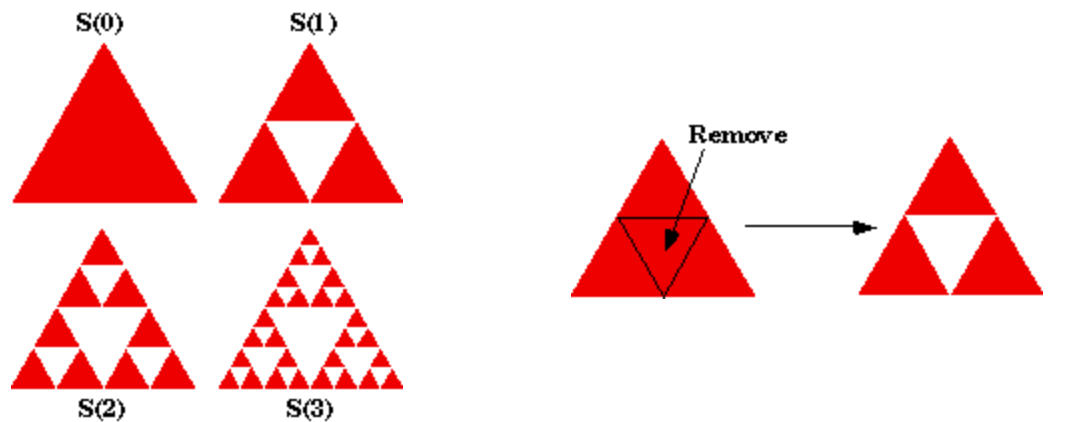
WebRing Graphics Sites
<< Prev | Ring Hub | Join | Rate | Next >>

Geometric fractals



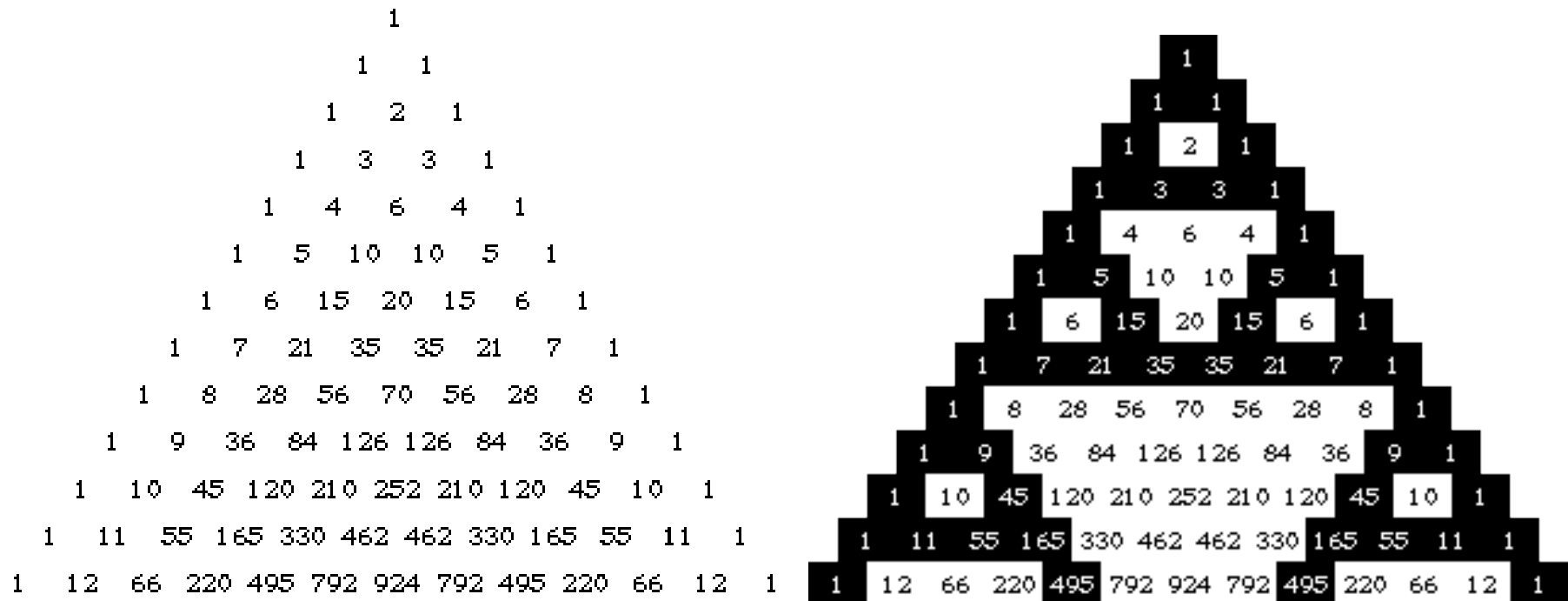
Generating the Sierpinski Triangle

- Geometric construction / L-system



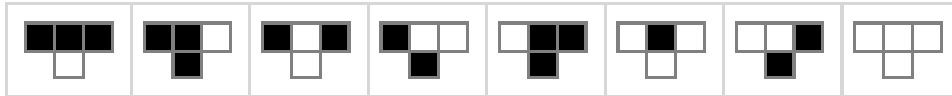
Generating the Sierpinski Triangle

- Pascal's triangle

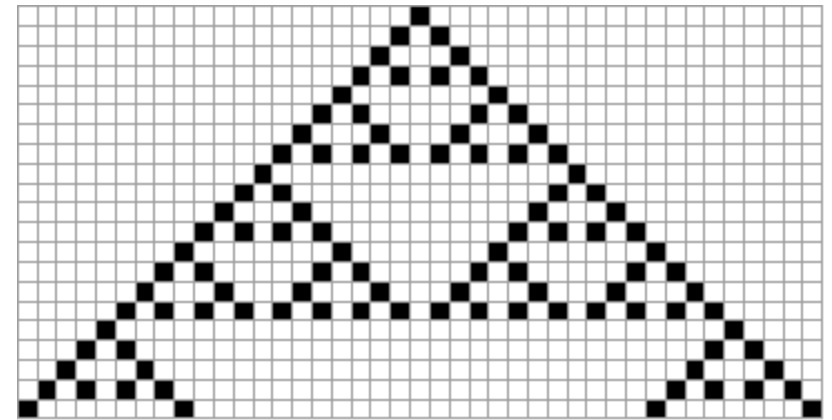


Generating the Sierpinski Triangle

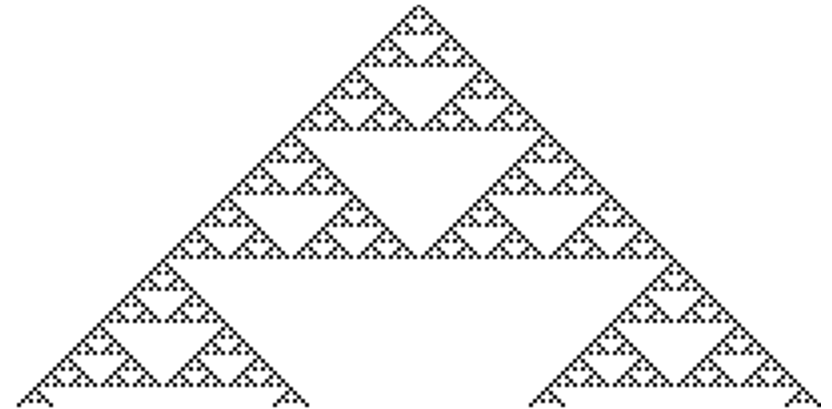
- Cellular automata
- Rule 90



1 ■ | 0 □



20 steps

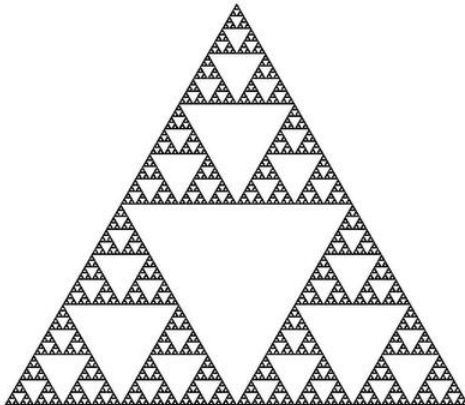


100 steps

Generating the Sierpinski Triangle

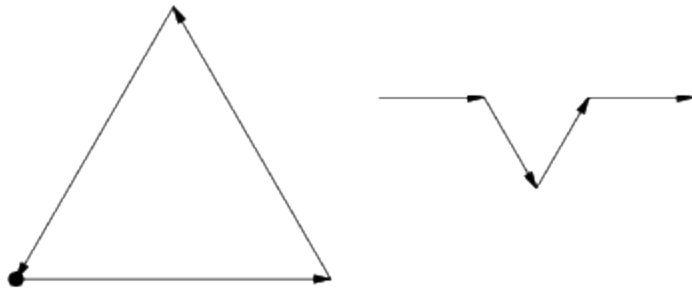
- Chaos game

```
do like... 10000 times or something:  
  p = randompoint()  
  for i=1..100:  
    p= (p+randomvertex())/2  
  plot black dot at p
```

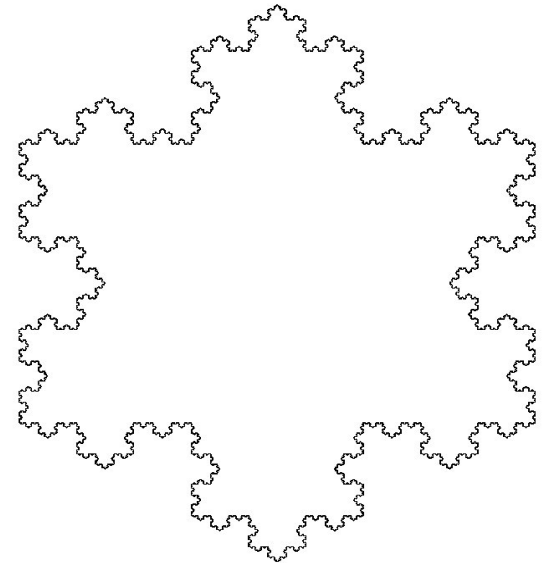
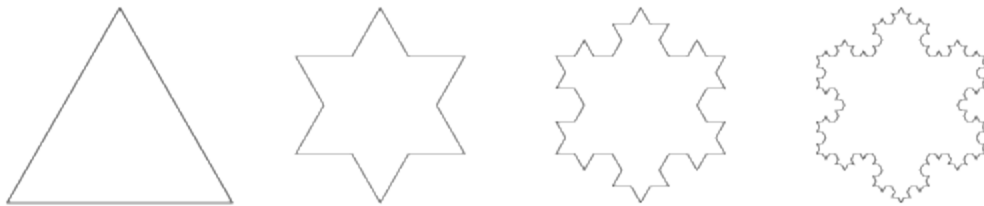


Koch Snowflake

L system basis and generator:



Iterations:



Perimeter calculation:

Iteration 0: 3

Iteration 1: $3 \cdot (4/3)$

Iteration 2: $3 \cdot (4/3)^2$

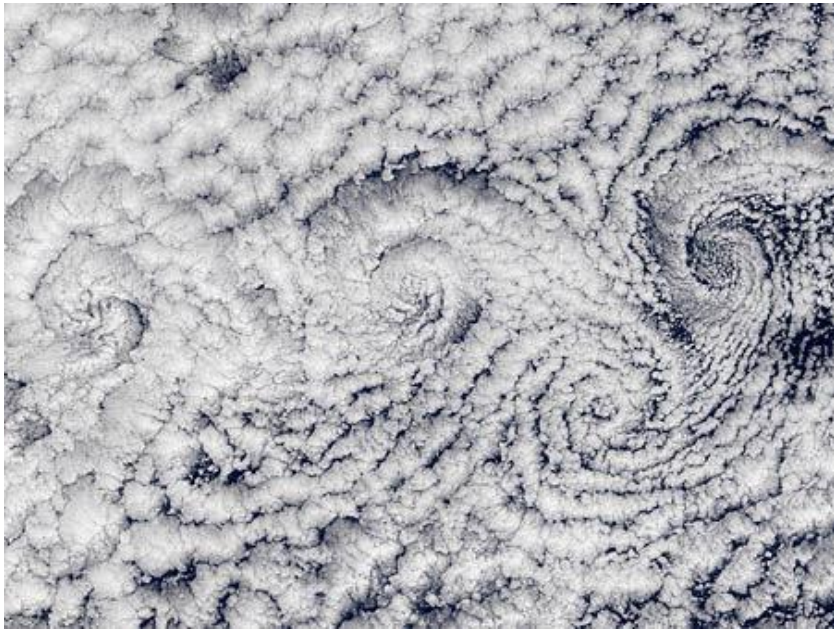
...

Iteration n: $3 \cdot (4/3)^n$

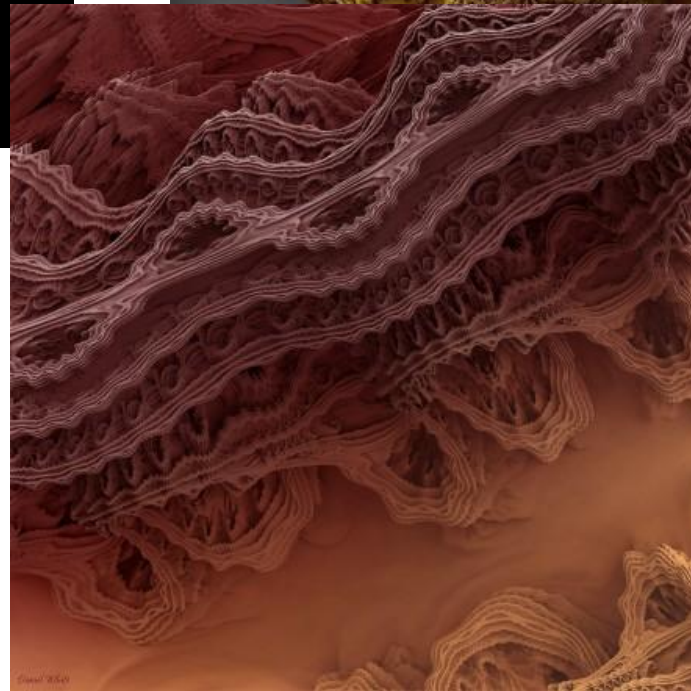
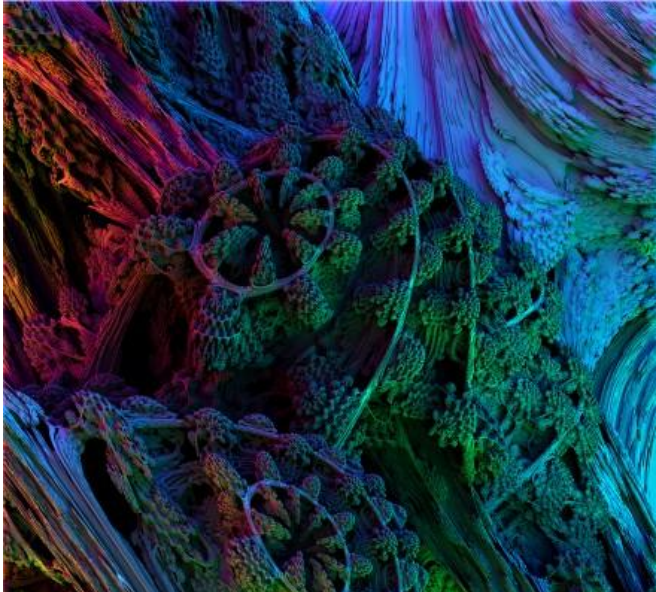
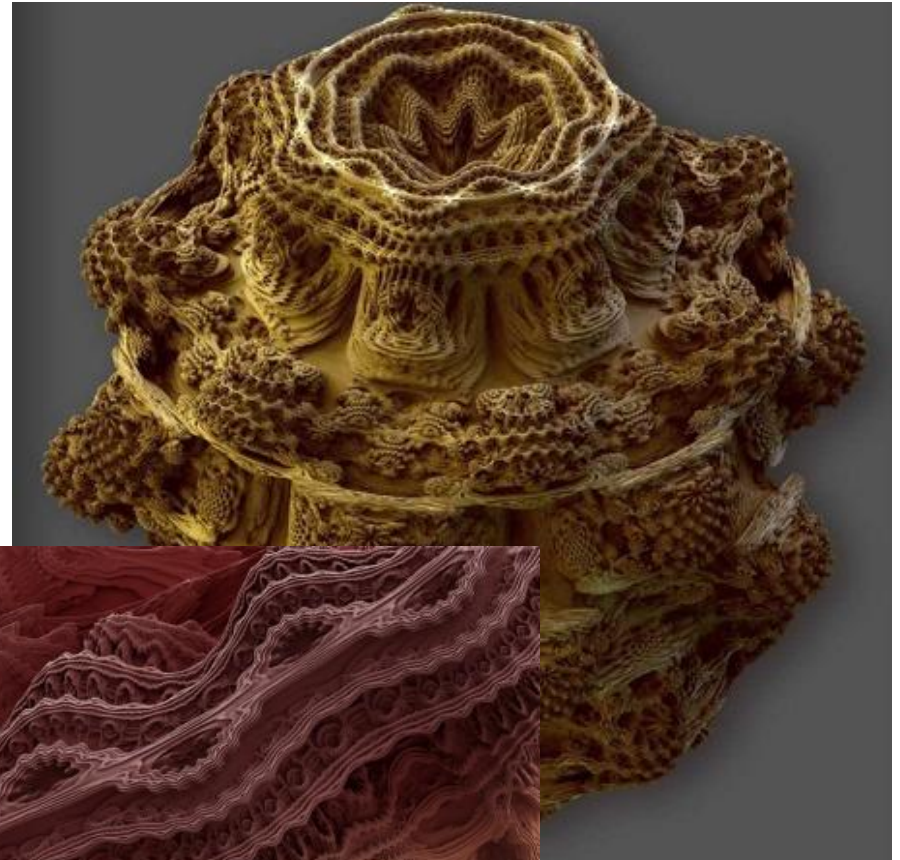
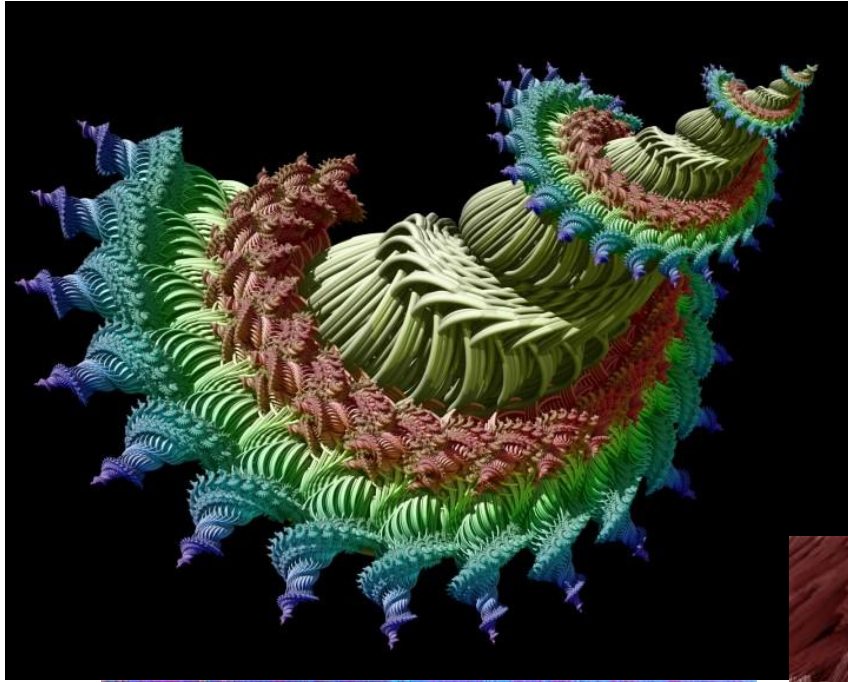
Fractals in nature



Fractals in nature



3D fractals



3D Fractals Video



Fractal music



return;

